

METHOD AND APPARATUS FOR DETECTING AN  
ABNORMALITY WITHIN A HOST MEDIUM UTILIZING  
FREQUENCY-SWEPT MODULATION DIFFUSION TOMOGRAPHY

5

ABSTRACT OF THE DISCLOSURE

Methods and apparatus are provided for detecting an abnormality in a host medium, such as a tumor within a patient's breast. The host medium is initially illuminated at a plurality of different positions with light of at least two different wavelengths. Following the propagation of the signals through the host medium, the amplitude and phase of the signals are detected and, based upon the detected signals, a shadow image can be created in which the abnormality is depicted as a suspicious region. Once a suspicious region has been identified, at least that portion of the host medium that contains the suspicious region is again illuminated with frequency-swept modulated signals of at least two different wavelengths generated by the light source and modulated by a modulator, such as a network analyzer. Based upon the detected signals that have propagated through at least that portion of the host medium that includes the suspicious region, a P-criteria can be determined that is dependent upon the coefficient of absorptivity of the host medium and embedded abnormalities. Likewise, an  $S_{var}$ -criteria can be determined based upon concentrations of oxygenated hemoglobin and deoxygenated hemoglobin. Based upon at least these criteria which reflect physiological parameters of the host medium and embedded abnormalities as well as the possible comparison of the shadow images to an x-ray image of the host medium, the abnormality can be characterized. In addition, an apparatus is provided that facilitates the compression of a patient's breast in order to improve the resulting images.

25

CLT01/4400286v2